Next 1 Page(s) In Document Denied

Director of Central Intelligence

~~Confidential~~

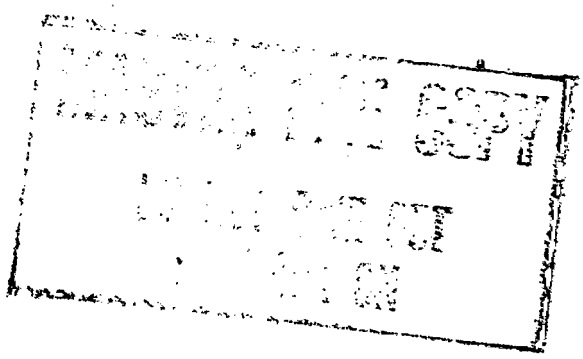
25X1

Dollar Costing of Warsaw Pact and Non-US NATO Defense Activities

25X1

Interagency Intelligence Memorandum

This Memorandum represents the views of the Director of Central Intelligence with the advice and assistance of the US Intelligence Community.



~~Confidential~~

IIM 88-10007
July 1988

Copy 736

Warning Notice	Intelligence Sources or Methods Involved (WNINTEL)
National Security Information	Unauthorized Disclosure Subject to Criminal Sanctions

STAT

IIM 88-10007

Dollar Costing of Warsaw Pact and Non-US NATO Defense Activities

25X1

Information available as of 1 July 1988 was used in the preparation of this Memorandum.

The following intelligence organizations participated in the preparation of this Memorandum:

The Central Intelligence Agency
The Defense Intelligence Agency
The National Security Agency
The Bureau of Intelligence and Research, Department of State
The Office of the Deputy Assistant Secretary for Intelligence, Department of Energy

also participating:

The Deputy Chief of Staff for Intelligence, Department of the Army
The Director of Naval Intelligence, Department of the Navy
The Assistant Chief of Staff, Intelligence, Department of the Air Force

This Memorandum was approved for publication by the Chairman of the National Intelligence Council.

25X1

25X1

25X1

Key Judgments

Dollar valuations of defense activities in Warsaw Pact and non-US NATO countries provide the only common, summary measure of the relative size of diverse defense programs and activities in these countries. These dollar valuations are the hypothetical costs of defense activities based on the assumption that they were purchased in the United States. The valuations are calculated to allow comparisons of the relative magnitudes of these programs and general trends in defense activities in terms that take account of both quantitative and qualitative differences.

25X1

Dollar costs of Soviet and other Warsaw Pact defense activities are estimated for five major resource categories: procurement, construction, military pay and allowances, operations and maintenance, and research, development, testing, and evaluation. Thousands of estimates are made for these categories, such as the annual production of weapon systems, detailed breakdowns of the number and rank structure of military personnel, and aggregate estimates of military construction activities. Estimates for some of these resource categories such as procurement, for example, carry high confidence; others, such as research, development, testing, and evaluation, have significant weaknesses.

25X1

There are no objective measures of the accuracy of aggregate dollar costs of foreign defense activities. Such dollar costs are a theoretical construct for which no objective "truth" exists. There are, however, some subjective and indirect objective measures of accuracy. In an overall sense, the results of dollar costing seem roughly in line with the forces observed in the field. Moreover, although applications of the methodology have been revised over the years, and the data are changed annually to incorporate new information, no radical changes in the aggregate results have occurred. Furthermore, the changes reveal no underlying bias in the estimates.

25X1

Perhaps because dollar costs are used in many ways in the analysis of US programs, dollar cost data on foreign military programs seem to convey to many readers information beyond the limited uses for which the data are applicable. Most questions relating to Warsaw Pact–NATO military issues are best answered using other measures. To answer questions about how

25X1

much a country is spending on defense, the share of national output devoted to defense (the burden of defense on the economy), or allocations of defense resources, indigenous prices should be used; US prices are not appropriate. Monetary measures cannot be used to compare the effectiveness of specific weapon systems and cannot take the place of detailed information about force structure and mission or intangible factors such as morale.

25X1

Contents

25X1

Figure 1
Measures To Use in Addressing Military Economic Questions [a]

How much is the United States spending on defense activities?	Dollar costs
What is the trend in the size of Warsaw Pact defense programs?	Dollar costs
How do Soviet defense economic activities compare with US defense activities?	Dollar costs
How do non-US NATO defense activities compare with US activities?	Dollar costs
How much are the Soviets spending on defense?	Indigenous prices
What share of Hungarian GNP goes to defense?	Indigenous prices
What is the impact of defense on the Soviet economy?	Indigenous prices
How do the East Germans allocate defense resources?	Indigenous prices
What are the trends in Soviet defense spending over time?	Indigenous prices
Are Soviet military capabilities greater than those of the United States?	Nonmonetary measures
Is a MIG-29 better than an F-18?	Nonmonetary measures

25X1

25X1

25X1

For What Issues Are Dollar Costs Appropriate?

Dollar costs are useful for comparing the relative size of and trends in defense programs among Warsaw Pact and NATO countries.[1] They provide a common unit of valuation, allowing comparisons with the US effort in terms familiar to US policymakers.[2] They can be used to compare the cost of all defense programs or program components, such as the quantities and different types of weapons procured, and operating and maintenance costs.

[2] The usual definition of foreign defense activities includes the foreign counterparts of the following US activities: national security activities funded by the Department of Defense, defense-related nuclear programs funded by the Department of Energy, Selective Service activities, the defense-related activities of the Coast Guard, and pensions. Border security forces that have wartime missions, premilitary training performed by civilian schools, and pay for reservists funded by civilian enterprises also are included

This definition of foreign defense activities excludes civilian space activities, civil defense programs, industrial mobilization preparations, dual-use infrastructure such as communication lines, reinforced bridges, and wider roads that may be used as runways. Also excluded are military assistance to foreign nations, military sales, and the cost of increasing and maintaining industrial stockpiles of reserves such as fuel, spare parts, and raw materials

Other measures are more appropriate for addressing other issues. For example, measures in a country's own currency using indigenous prices should be used in calculating:

- How much a country is spending on its defense programs.
- The share of national output going to defense.
- The relative share of resources going to the various components of defense.
- Internal perceptions of spending trends.

25X1

Furthermore, for comparisons of particular force or weapon capabilities, no monetary measure can reflect all the factors that bear on effectiveness.

25X1
25X1

Because the appropriate and inappropriate uses of dollar costs are not always inherently clear, the Intelligence Community recommends that the information contained in annex A appear in intelligence papers that refer to dollar costs of foreign defense activities.

25X11

25X1

Figure 2
Alternative Concepts for Valuing Foreign Programs in US Dollars

	Comparable Dollar Costs	Alternative 1	Alternative 2	Alternative 3
Ways to fulfill military mission	Foreign choice	US choice	Foreign choice	Foreign choice
System or unit design	Foreign choice	US choice	US choice	Foreign choice
Production technology and organization	US choice	US choice	US choice	Foreign choice
Advantages	For US policymakers, the most appropriate monetary measure for comparing the size of US defense activities with those of another country.	Once the mission and the means to accomplish it are specified, it is relatively easy to cost because most components will have already been procured in the United States.	US cost estimating methodologies are well developed for US designs.	Measures the cost of a foreign country's defense activities, assuming its price and wage structure were identical to the United States.
Disadvantages	Requires developing costing methodologies for foreign designs.	The choice of means is highly subjective. Judgment of the degree to which the foreign country has been successful in meeting its mission objectives is required.	Must design many new US weapon systems for foreign choice of force mix.	Large amounts of foreign data required. It is not clear the answer is of any interest.

What Do Dollar Costs Measure?

Dollar costs of Warsaw Pact and non-US NATO defense activities are the hypothetical costs of those activities based on the assumption that they were purchased in the United States. They measure the cost—at prevailing US prices and wages—to develop, equip, man, maintain, and operate a foreign military force. These costs are calculated for the forces, weapons, and operating practices of the foreign country. They assume these forces are produced and operated using US industrial technologies and practices. It is also assumed that the requisite production base is available in the United States, complete with a trained work force, qualified suppliers, and the other necessary ingredients to duplicate the foreign output at US efficiencies but using Warsaw Pact production schedules. Although other cost concepts could be employed, this method of valuation, which we call comparable dollar costs, represents, in our view, the best way of calculating dollar costs of Warsaw Pact and non-US NATO defense activities because (a) it measures the cost of the actual foreign force, (b) sufficient information is available to undertake the calculation, (c) the burden of making the calculation is not excessive, and (d) it uses prices familiar to US policymakers.

Other concepts that would yield different results are possible. These alternative concepts differ in the degree to which they "Americanize" the foreign activities. For this purpose, a given foreign activity can be described in terms of:

- Its mission, purpose, or objective—for example, to defend the homeland against bomber attack.
- The mechanism or means chosen to carry out its mission—such as a choice between fighter interceptors and surface-to-air missiles (SAMs).
- The organization and technologies employed in producing the specific designs.

At one end of the spectrum, each foreign activity could be calculated on the basis of how the United States would actually carry out the mission as defined by the foreign country—see alternative 1 listed in figure 2. For example, had US planners been tasked with carrying out the Soviet air defense mission, they might have chosen a different doctrine or mix of weapon systems than the Soviets. Once a mission means was decided, they might have designed a different SAM system. Once the missile was designed, it would have been produced in a US plant. In essence, this concept calls for measuring the costs the United States would incur if it had another country's military requirements and were about as effective as that country in meeting them. This concept is difficult to apply, however, because the first step—specifying the mission means US planners would choose—is quite subjective. Nevertheless, this concept is appropriate if one wishes a summary measure of the relative magnitude of two or more countries' overall defense postures. 25X1

Another methodology—alternative 2 in figure 2—would accept the foreign choice of mission means, then use US designs and production efficiencies to produce and man those systems. This concept measures the cost the United States would incur if it were to procure, operate, and maintain military forces with the same general kinds and amounts of weapons, equipment, and personnel as a selected foreign country. Because the application of this concept would require redesigning foreign weapons to meet US standards and specifications, it is costly to apply. Moreover, the application of US design standards and specifications (for example, redundant subsystems for reliability, air conditioning, and other habitability features) to Soviet forces generally results in a higher quality and hence more costly force. The concept is appropriate, however, in order to measure the costs the United States would have incurred had it procured the foreign force mix for its own efforts instead of the US force mix. 25X1 25X1

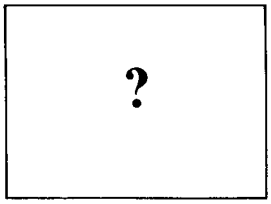
Another technique—alternative 3 in figure 2—would use all foreign designs and efficiencies but at US prices and wages. For example, the dollar cost of producing an SA-10 missile would be calculated by applying US cost factors to all the physical resources, such as materials and labor, actually used by the Soviets when they produce the missile. However, detailed data on the manufacturing practices of Warsaw Pact countries would be needed to apply this technique. 25X1 25X1

Figure 3
Costing Methodologies[a]

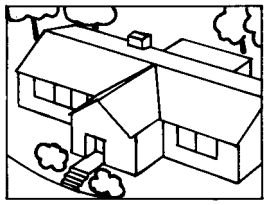
Increasing information

US Analogue

Unknown Quality of Gorbachev's Dacha



Known Quality of Presidential Ranch House



Cost to build = $1,000,000

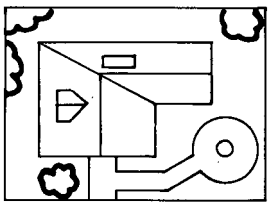
Known data for dacha: None

Methodology: Use the President's house as an analogue. Adjust the cost, assuming the dacha has smaller rooms and fewer comforts. Estimate at 90 percent of cost of ranch house.

Estimated cost: $900,000

Product-Group Cost-Estimating Relationship

General

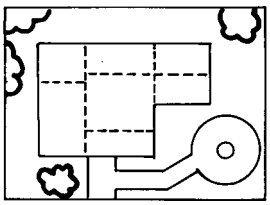


Known data: General characteristics such as number of rooms, outside dimensions, and architectural style.

Methodology: Total square footage = 10,000. Number of rooms = 16. Costs per square foot and per room are estimated. Cost = $60,000 + $20 per square foot + $15,000 per room.

Estimated cost: $500,000

Detailed

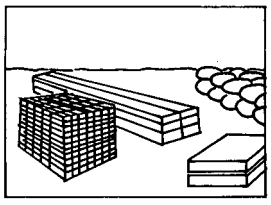


Known data: Detailed design specifications available for a number of other Soviet dachas are used to improve the estimates on costs per square foot and per room.

Methodology: Total square footage = 10,000. Number of rooms = 16.
Cost = $40,000 + $25 per square foot + $10,000 per room.

Estimated cost: $450,000

Product-Specific Industrial-Cost Estimate



Known data: Complete specifications on dacha.

Methodology: Estimate detailed material and labor costs.

Estimated cost: $462,200

[a] Cost calculations are for the Gorbachev dacha, and representations and costs are notional.

317773 6-88

25X1

How Are Dollar Cost Estimates Formulated for Warsaw Pact Programs? [3]

Dollar costs of Soviet and other Warsaw Pact defense activities are estimated for the five major resource categories: procurement, construction, military pay and allowances, operations and maintenance (O&M), and research, development, testing, and evaluation (RDT&E). There are five primary sources of dollar costs for the first four categories.[4] In order of preference they are:

- *US price lists.* This method is used when the foreign good or service is identical, or nearly so, to a US good or service. For example, US prices are applied directly to military manpower billets, food, and similar consumables.

- *Product-specific industrial-cost estimates.* This method is used when either direct access to a foreign good or detailed design specifications are available. A US manufacturer of similar items estimates the material and labor required to produce the good and then applies his standard cost factors.

- *Product-group cost-estimating relationships (CERs).* The costs of weapon systems within a particular product group, such as major surface combatants or tactical aircraft, are estimated by associating costs with various major characteristics of the systems. This technique, also called parametric costing, uses historical costs for weapons and mathematical analysis to develop the appropriate factors relating these costs to the system's characteristics. For example, the weight and top speed of a fighter aircraft have in the past proved to be major determinants of its cost. If the maximum speed and the weight of a Soviet fighter were known but other characteristics were not (for example, airframe materials and internal configuration), the cost estimate would be based on the average cost to a US manufacturer of producing a fighter with the same speed and weight. The preferred way to calculate these relationships is to develop a *detailed CER* based on product-specific industrial-cost estimates of foreign systems within the product group. When the data needed to develop product-specific costs are not available, a *general CER* is developed based on costs for US systems and adjusted to reflect known design differences.

- *US analogue.* For those cases where the data are not available to take advantage of the above methods, the cost of the most similar US good or service is taken. If the US good is quite unlike the foreign good, the US price is *adjusted* to reflect the differences.

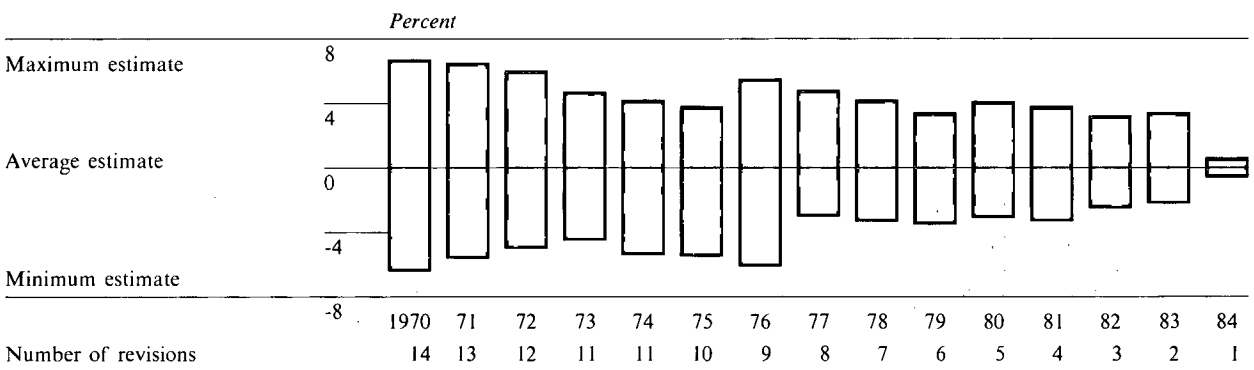
- *General factors.* For items too small to warrant development of costs by the above methods, dollar costs are estimated using the ratio of similar costs in the US military to the number of personnel in a similar organization. This technique is applied to small items such as furniture, office equipment, and supplies. Similarly, maintenance costs are also usually estimated by applying factors to the procurement cost of the item being maintained. 25X1

On balance, the choice of costing method and the degree of confidence in the resultant price estimate depend on data availability. Confidence in price estimates is highest for those defense components that are nearly identical to US components and lowest for those components for which descriptive information is scarce. Over one third of the procurement estimate is based on the highest quality costing methods, that is, specific industrial cost estimates and detailed cost estimating relationships. (See figure 6 on page 10.) The application of these different approaches to dollar costing is shown in figure 3. 25X1

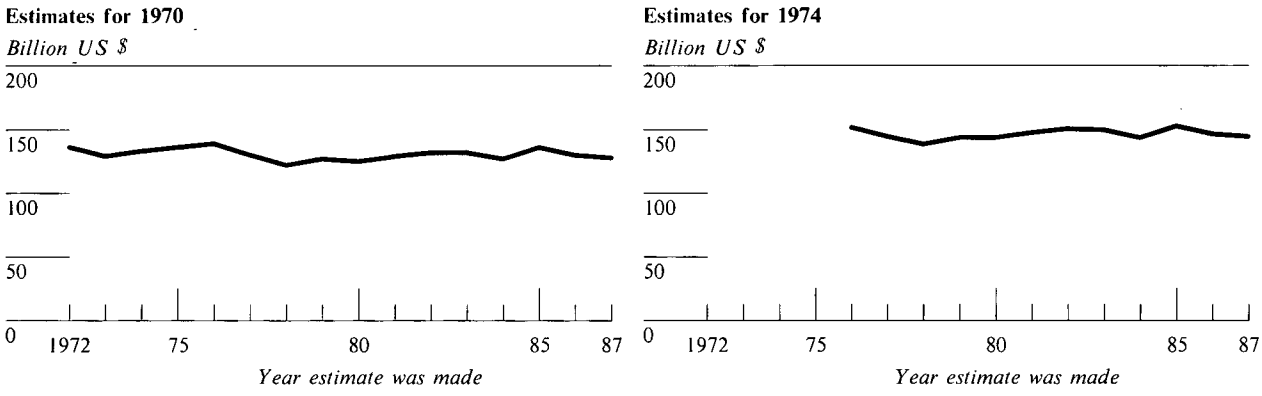
[3] See annex B for additional details on non-Soviet Warsaw Pact costing

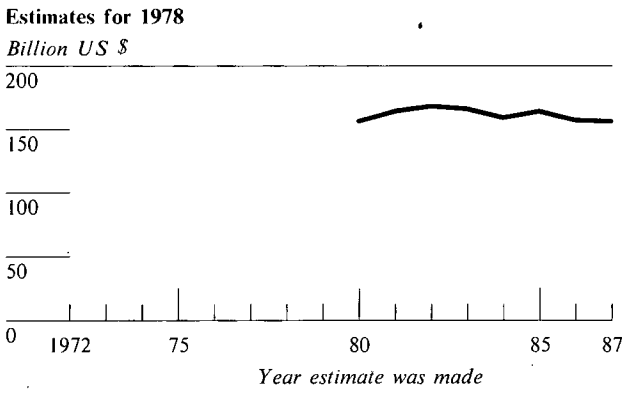
[4] See annex C for details of Soviet RDT&E costing

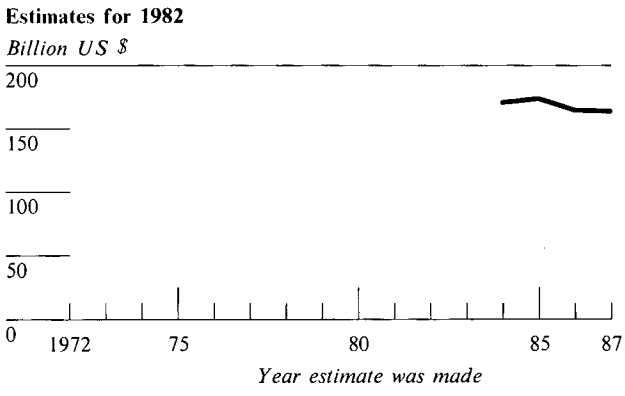
Figure 4
Variations in Dollar Cost Estimates of Soviet Defense Activities



How Have the Estimates Changed?







317774 6-88

25X1

What Is the Confidence in the Estimate?

There are no objective measures of the accuracy of dollar costing; dollar costs of foreign military programs are a theoretical construct for which no objective "truth" exists. There are some subjective and indirect objective measures of accuracy, however. In an overall sense the results of dollar costing seem to be roughly in line with the forces observed in the field (see annex D). Further, when dollar prices are used to aggregate the procurement estimates for major weapon systems, as detailed in the IIM on Soviet weapons production, the total dollar cost of those systems assigned "high" and "high-moderate" confidence account for approximately 80 percent of the procurement cost of all systems. Second, although applications of the methodology have been revised over the years (for example, some items are changed from general CER to specific industrial costs as more information becomes available) and the data are changed annually to incorporate new information, no radical changes in the aggregate results have occurred.

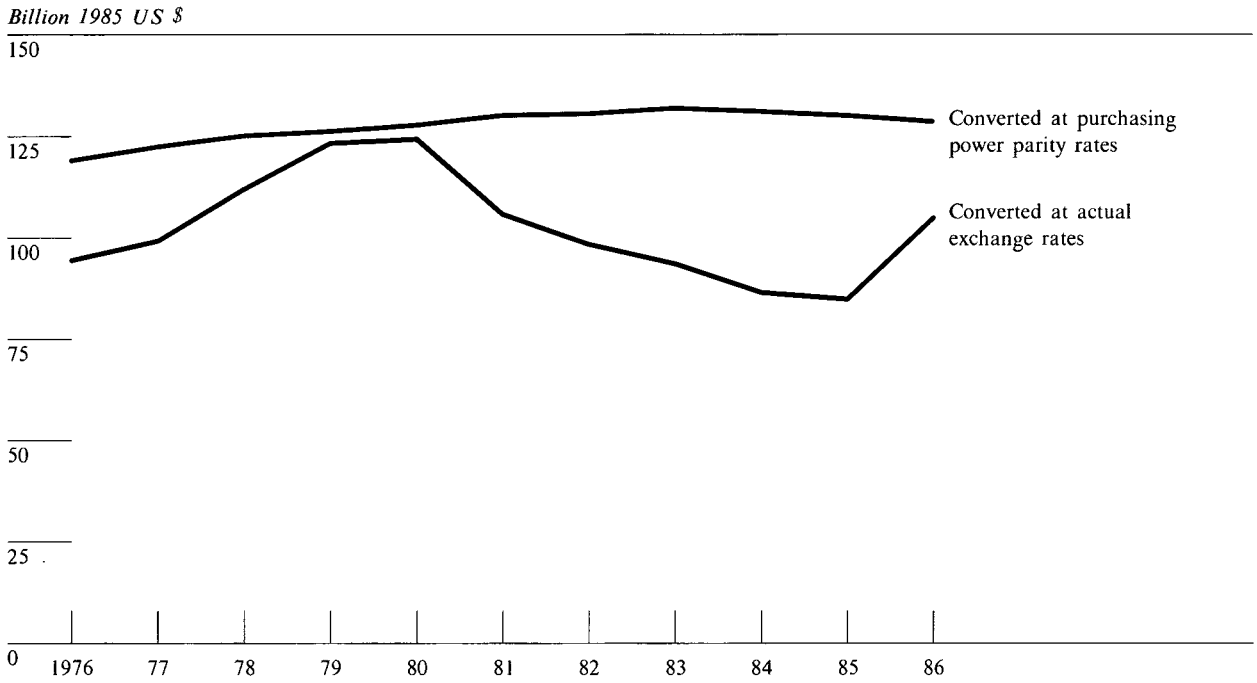
The top chart in figure 4 shows the range of variation in the cost estimates. It shows the largest percentage difference between the average estimate for a given year of total Soviet defense costs and all of the other estimates that have been made for the same year. For example, the estimate for 1971 has been revised 13 times since 1973. Some revisions increased the 1971 estimate and some decreased it; but at no time did the 1971 estimate differ from the average estimate by more than 7 percent. These results show that inclusion of new information on deployments, weapons characteristics, and operating practices do not lead to wholesale changes in the dollar cost estimates. In some instances, our understanding of the deployment or design and performance characteristics of individual items has changed significantly. The effects of these changes on total costs, however, have tended to be offsetting. 25X1

The lower set of charts in figure 4 shows the lack of trend in revisions, indicating that introduction of new information and techniques did not introduce a trend or bias in the results. For example, the figure 4 chart "Estimates for 1970" tracks the revised estimates made to the original calculation of Soviet dollar costs for defense activities in 1970. 25X1

The results and, in a sense, the "accuracy" of the technique are also affected by the prices used in making the valuation because the relative efficiencies of economic sectors vary among countries. For example, Soviet investment in defense is about 25 percent of total defense costs when valued in dollars and 50 percent when valued in rubles. This is because, in relative terms, manpower outlays are much lower in the USSR and production costs are much higher. Ruble valuations of US outlays would show a similar change in US investment shares. Despite these differences, when the cost comparisons are done in rubles rather than dollars, the ratio of Soviet defense activities to US activities over the past two decades increases by only about 10 percent. 25X1 25X1

Dealing with technologies that cannot or have not been produced in the country whose currency is used for valuation also is a problem. The Soviets have not and likely could not produce some items in the US arsenal; the United States has not manufactured a submarine with a titanium hull as the Soviets have. In such cases, it is assumed that the technology can be produced and costs are increased by a subjective amount. Such judgments, however, form only a small portion of the overall estimate. 25X1

Figure 5
Dollar Costs of Non-US NATO Defense Activities



317775 7-88

25X1

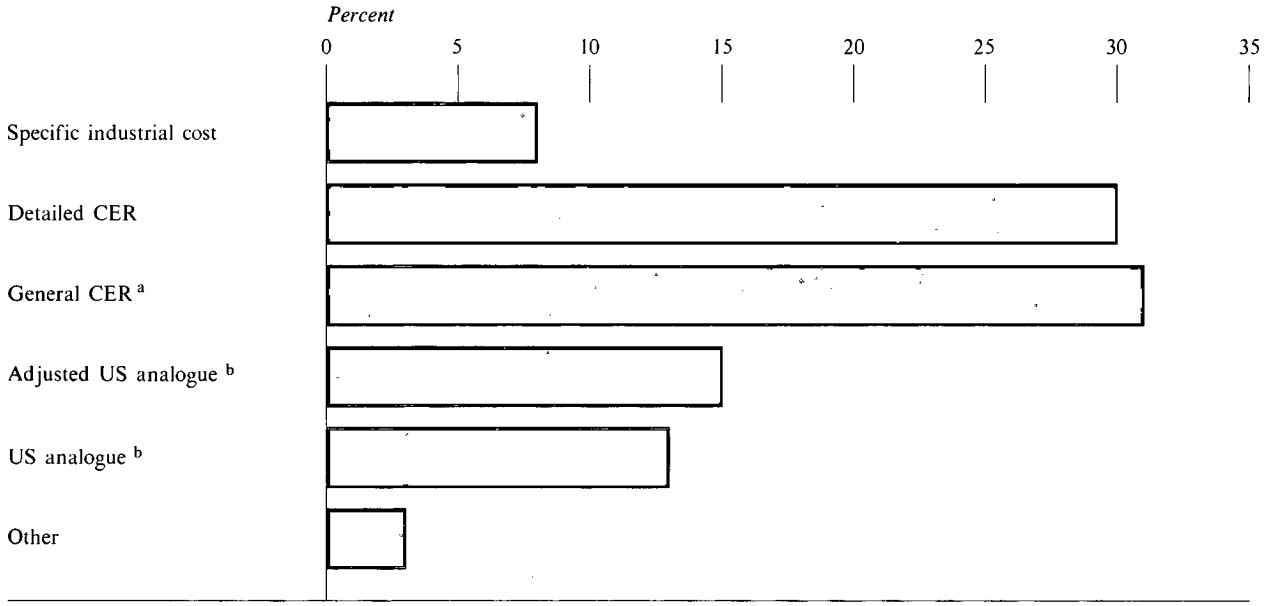
How Are Non-US NATO Costs Estimated?

Because data are available on outlays for non-US NATO forces in national currencies, dollar costs are calculated based on foreign budget information and converted into comparable dollars from national currencies:

- The level of effort in national currency terms is obtained from the NATO Defense Planning Questionnaire (DPQ).
- Because the wide fluctuations in market exchange rates would distort the results, data in national currency spending terms are converted into "comparable" US dollars using "purchasing power parity" exchange ratios.
- The parity ratios are chosen to reflect the relative prices of defense goods and services in NATO countries and the United States. (Such parity ratios have been estimated by the United Nations for a wide variety of civilian goods and services for many countries, including most NATO countries. The closest civilian analogue ratios have been used in the conversion of non-US NATO costs.) [5]
- Manpower costs are derived by applying US pay and allowances to European manpower levels. 25X1

[5] For example, if in a given year the cost of a hunting rifle is 200 marks in Germany and $100 in the United States, the parity ratio for the rifle component of defense outlays in the German-US comparison would be 2 marks to $1. Thus, if the Germans reported 100 million marks were spent for outfitting military personnel with rifles, the corresponding dollar value would be $50 million. 25X1

Figure 6
Relative Use of Different Costing Methods in Estimating Dollar Costs of Soviet Procurement



[a] About 85 percent of Soviet ship procurement costs are based on general CERs.
[b] Most stand-alone electronics procurement costs, such as for mobile radars, are based on the cost of the closest US analogue. Half of nuclear weapons procurement costs are taken from analogues adjusted for estimated design differences.

317776 6-88

25X1

Annex A

Guide To Using Dollar Valuations of Defense Activities

Dollar valuations of Warsaw Pact and non-US NATO defense activities estimate the cost, using prevailing US prices and wages, to produce and man a military force of the same size, armed with the same weapons, and operated in the same manner as that of the foreign country. They provide a common denominator to summarize the diverse activities that are associated with military programs and to portray the relative magnitudes of these programs and general trends in defense activities in terms that take account of both quantitative and qualitative differences

Dollar valuations should not be used to measure: (a) actual defense spending, (b) the impact of defense on a foreign economy, or (c) a foreign leader's perception of his country's defense activities. Valuations in foreign currencies should be used for these purposes. Also, dollar valuations should not be used to compare military capabilities. Such assessments must take account of accumulated stocks of military weapons, equipment, and supplies; military doctrine and battle scenarios; the tactical proficiency, readiness, and morale of forces; the effectiveness of weapons; logistic factors; and many other considerations.

25X1
25X1

Annex B

Estimating Dollar Costs of Non-Soviet Warsaw Pact Defense Activities

Dollar costs for non-Soviet Warsaw Pact (NSWP) countries are estimated in almost the same way as those for the Soviet Union. Dollar values of Pact defense activities are developed by identifying and listing distinct components of the forces such as individual classes of surface ships, ground forces divisions, and air regiments. The listing also contains for each component an estimate of order of battle, manning levels, equipment inventories, and new equipment purchases. US prices and wage rates are applied in the valuation of these activities.

Because most Pact weapons and equipment are imported from the Soviet Union, the average unit dollar cost derived for the relevant Soviet production runs are used for NSWP items. For indigenous production, the methods used for the USSR are applied. Procurement of support equipment—which accounts for roughly one-half of total procurement in the non-Soviet Warsaw Pact—is more uncertain than procurement estimates for major weapon systems because support equipment is difficult to monitor on an item-specific basis.[6]

Research, development, testing, and evaluation (RDT&E) costs for Poland, Czechoslovakia, and East Germany are estimated in domestic currencies based on published budget data and converted into dollars at the same rate of conversion as implied by other military expenditures. RDT&E costs for the other NSWP countries, for which RDT&E data do not exist, are assumed to be in the same ratio to total military outlays in dollar terms as for the other NSWP countries.[7]

25X1

The dollar costs for Soviet personnel are based on the estimated rank of the person the United States would assign to carry out similar functions. Because detailed data on NSWP rank structure are not available, US pay rates are applied to categories of personnel rather than to individual rank.

25X1

In general, we believe the estimate of the total dollar cost of NSWP defense activities represents a reasonable measure of their aggregate level. Among individual NSWP countries, however, the confidence in the estimate varies. We are most confident for the northern tier countries and Hungary, and least confident for Romania and Bulgaria. Lack of country-specific information on operating rates and a lower level of confidence in manpower estimates for Romania and Bulgaria make cost estimates for those countries less certain.

25X1

[6] Support equipment includes electronics, vehicles, engineering equipment, naval supplies and equipage, organizational equipment, and aircraft ground support equipment.

25X1

[7] *Joint Economic Committee, East European Economies: Slow Growth in the 1980s*, 1985, pp. 475-495

25X1

Annex C

Costing Soviet Research, Development, Testing, and Evaluation

Costing research, development, testing, and evaluation (RDT&E) in dollars presents a serious problem, largely because of difficulties in defining the product.[8] At one extreme, the product could be taken as the Soviet military RDT&E establishment. Dollar prices and wages could then be applied to each component of the establishment. This would result in a huge estimate because the Soviets generally employ far more personnel and use more materials and facilities than the United States to achieve similar advances. A more reasonable definition of "product" would be the final results of the Soviet RDT&E establishment, the knowledge and designs that allow advances in weapon systems. The cost in the United States to perform the RDT&E required to produce the weapons the Soviets do would be small, because the Soviets generally lag the United States by some years and little US RDT&E would be required to produce many Soviet designs. As a result, the method now used to estimate the dollar cost of Soviet RDT&E tries to take into account differences in the productivity of the RDT&E process in the two countries.

25X1

First, Soviet facilities involved in military RDT&E are identified and all-source data on resource costs—including wages, materials, equipment, training, and operating and capital costs—are used to calculate total expenditures in rubles for these activities. Although data gaps make this ruble cost estimate more uncertain than ruble cost estimates for other components, the error in rubles probably is within plus or minus 15 to 20 percent.

25X1

This ruble estimate is converted to dollars using a ruble-dollar ratio that reflects relative Soviet and US efficiencies in producing Soviet weapon systems. Use of this conversion factor assumes that the Soviets have about the same difficulty in RDT&E compared to the United States as the Soviets experience in weapons procurement. Despite substantial past and continuing efforts to refine and improve our estimative methodology for Soviet RDT&E, it remains the weakest component of the aggregate dollar cost of Soviet defense activities.

25X1

25X1

25X1

Annex D

The Procurement Paradox

Dollar cost estimates are frequently challenged because the Warsaw Pact countries procure a substantially larger number of weapons than NATO countries for roughly the same or smaller dollar costs. Several factors help to explain this apparent contradiction:

- The Warsaw Pact achieves greater economic benefits by opting for long, high-volume production runs. Also, short-run political uncertainties probably do not affect production decisions.

- These economies are achieved in part because the Soviet Union dominates the Warsaw Pact, accounting for some 85 percent of the total dollar costs of Pact military activities.

- Further, Warsaw Pact weapon designs have been generally simpler and less costly to produce than those of NATO countries. Pact designs usually:
  - — Are less sophisticated.
  - — Are designed for a short mission life with few redundant subsystems.
  - — Lack mission flexibility.
  - — Use commercial-grade components.
  - — Are maintainable by low-skilled personnel in the field or else require factory repair.

25X1